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# The Commonwealth of Massachusetts



Metropolitan District Commission

GOVERNMENT DOCUMENTS

Sewerage Division

COLLECTION

JUN 2 1983

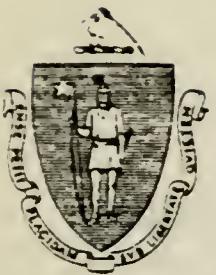
63rd Annual Report

University of Massachusetts

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FOR FISCAL YEAR ENDING JUNE 30, 1982





The Commonwealth of Massachusetts  
Metropolitan District Commission  
20 Somerset Street, Boston 02108

SEWERAGE DIVISION

December 10, 1982

Richard A. Nylen, Commissioner  
Metropolitan District Commission  
20 Somerset Street  
Boston, Massachusetts 02108

Dear Commissioner Nylen:

SUBJECT: Annual Report

The Sixty-Third Annual Report of the Sewerage Division covering the fiscal year ending June 30, 1982 is submitted for your review and information.

This Office will be pleased to discuss or amplify the contents of the report to any extent desired.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Noel D. Baratta".

NOEL D. BARATTA, P.E.  
Director and Chief Engineer

PJC/cas

Enclosure



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## DIRECTOR'S MESSAGE

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When I was named Director and Chief Engineer of the Sewerage Division in August of 1981, the Division was still settling down from a major reorganization that was implemented in May of 1981.

To me the most critical task at that moment was to get the Division moving again in its designated duty to supply proper collection, transport, treatment, and disposal of wastewater from the member communities; keeping in mind the restraints of level funding and reduced staffing authorizations. This objective was accomplished.

Major emphasis continued through the year on Divisional sub-structure coordination, consultant contract verification, planning, design, and construction of key projects necessary to achieve the Divisional objectives as previously stated.

In May of 1982 Commissioner Nylen was named to head this agency. His early grasp of the problems facing the Sewerage Division and his constant support of our efforts have been a major factor in our continued progress.

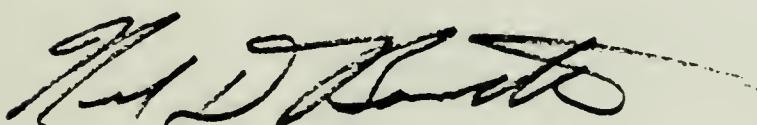
A key element in this progression has been the development and implementation of a five-point plan for the Division. The plan calls for the retrofitting and upgrading of both the Deer Island and Nut Island Treatment Plants; interceptors and pumping stations; additional combined sewer overflow (CSO) facilities and reemphasizing the Industrial Waste Pretreatment Program. Regarding this program, I am pleased to say that it has been unconditionally approved by the Federal Government during this past year. This program, combined with the Division's emphasis on people oriented activities such as the Citizens Advisory Committees will facilitate the forward movement of the Division.

I compliment my staff for their efforts and support over the past year, a difficult and transitional year for all of us. I am convinced that our goal to obtain a cleaner Boston Harbor in the next decade will be realized if we continue our efforts of this first year of progress.

To the member communities my hope is that this Annual Report offers helpful information and insight into the operational plans and activities of the Division.

I look forward to working with local representatives and member communities to achieve, what I am sure is our common goal, a Division operating efficiently on sound engineering principles in a cost effective manner.

Respectfully,



NOEL D. BARATTA, P.E.  
Director and Chief Engineer



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## ORGANIZATION

Noel D. Baratta, P.E., Director and Chief Engineer of the Sewerage Division

Principal Assistants are:

Robert J. Holthaus,	Director of Treatment Systems
Ignatius N. Caruso,	Director of Collection Systems
George D. Gallagher,	Director of Administration
Jean M. Haggerty,	Director of Project Planning and Management
Wayne T. Grandin,	Chief Engineer of Industrial Waste

As of October 20, 1982, four hundred and forty-one positions of the five hundred and eighty-eight positions authorized were funded to be filled in the Metropolitan District Commission, Sewerage Division. However, on the average only four hundred and seventeen positions were actually staffed during the fiscal year. The total staffing is assigned to provide collection, transport, pumping, treatment and disposal of wastewater on a continuous twenty-four hour per day basis and was assigned according to the following groupings:

Fourteen (14) positions assigned as supervisory / management.

Sixteen (16) positions assigned as clerical.

Nine (9) positions assigned for design, and planning of all facilities and systems.

Twenty-nine (29) positions assigned to the preparation of facility rehabilitation, contracts, sewer relief design, and industrial programs as staff engineers.

One hundred and thirty-nine (139) positions assigned to maintain, repair and operate the collection system. This included sewer lines, pumping stations and combined sewer overflow (CSO) facilities.

Two hundred and forty-two (242) positions assigned as plant engineers, technical, laboratory, operational and maintenance personnel within the wastewater treatment service.

Fourteen (14) positions assigned to industrial waste programs as staff engineers and chemists.

## ADMINISTRATION

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The Director and Chief Engineer of the Sewerage Division has charge of the design and construction of new works, and the maintenance and operation of all the works controlled by the Metropolitan District Commission for removing sewage from forty-three municipalities comprising the Metropolitan Sewerage District.

The work includes the maintenance and operation of ten (10) pumping stations, two (2) storm water detention and chlorination plants, two (2) wastewater treatment plants, four (4) pretreatment headworks and 228.01 miles of Metropolitan Sewers receiving the discharge from 5,344.67 miles of town and city sewers at 1,818 points, together with the care and routine work of inspecting, cleaning and maintaining sewers, siphons, tide gates, outfall sewers, the inspecting of connections to Metropolitan Sewers, and the care of pumping stations, treatment plant, other buildings and grounds.

Under the Director and Chief Engineer are five (5) Sub-Directors who are responsible for a separate segment of the Division, and report directly to the Director and Chief Engineer. The Sub-Directors are as follows:

Director of Treatment Systems is responsible for the operation of both Deer and Nut Island Sewage Treatment Plants, headworks, outfalls and adjacent appurtenants.

Director of Collection Systems takes the responsibility for the operation and maintenance of ten (10) pumping stations, two (2) combined sewer overflow (CSO) facilities, and 228.01 miles of sewer lines.

Director of Administration is responsible for the Division's budget and dispensing of funds to various payable accounts. This section also has the responsibility of filling vacant positions and posting job vacancies within the Division.

Director of Project Planning and Management, has the job duty to oversee the Division's contracts, rehabilitiation of facilities, retrofit design work, and public participation of Division projects.

Chief Engineer of Industrial Waste is responsible for all activities related to industrial waste discharges to the sanitary sewer system including the Industrial Waste Inspection, Permit, and Monitoring Programs, as well as municipal permits, septic waste discharges, application for a waiver of secondary treatment, training various personnel in hazardous waste activities, and responding to citizen's complaints regarding any of the aforementioned areas of concern.

## COLLECTION SYSTEMS

Average Daily Volume of Sewage Lifted at Each of the Ten  
Metropolitan Sewerage Pumping Stations During the Year, as  
Compared with the Corresponding Volumes for the Previous Year

PUMPING STATION	<u>Average Daily Pumpage</u>			
	1981 Gallons	1982 Gallons	Difference	During Year Per Cent Increase
Alewife Brook	9,860,000	10,970,000	1,110,000	11.3
Braintree-Weymouth	16,030,000	22,820,000	6,790,000	42.4
Charlestown	28,100,000	29,140,000	1,040,000	3.7
East Boston	5,860,000	16,390,000	10,530,000	179.7
East Boston Electric	No Meter	—		
Hingham	350,000	600,000	250,000	71.4
Hough's Neck	No Meter	—		
Quincy	6,150,000	7,940,000	1,790,000	29.1
Reading	2,220,000	2,740,000	520,000	23.4
Squantum	780,000	890,000	110,000	14.1

## METROPOLITAN SEWERS

### Sewers in Operation and Their Connections

At the end of the year there was a total of 228.01 miles of Metropolitan Sewers in operation with the Sewerage District. Of this total, 12.88 miles of sewer, along with the Quincy Pumping Station, have been purchased from cities and towns of the district and the U. S. Navy.\* The remaining 215.13 miles of sewers and other works have been constructed by the Metropolitan Boards.

The locations, lengths and sizes of these sewers are given on page 6, together with other data referring to the public and special connections with the system.

\* Hingham Force Main

Total Population	Miles of Local Sewer Connected	Estimated Population Contributing Sewage	Ratio of Contributing Population to Total Population (Per Cent)	Connections Made with Metropolitan Sewers	Public	Special	MDC
2,056,504	5,344.67	1,878,025	91.3	876	900	42	

#### MATERIALS INTERCEPTED AT THE SCREENS

The material removed from sewage at the screens of the Metropolitan Sewerage Facilities consisting of rags, paper and floating materials has, during the year, amounted to 980.0 cubic yards.

#### METROPOLITAN SEWERAGE OUTFALLS

The Metropolitan Sewerage District has outfalls located in Boston Harbor at ten points, five of which may discharge sewage from Deer Island, and five from Nut Island. Of the five from Nut Island, one is for digested sludge and the others are for effluent.

The two main outfalls from Deer Island discharge near Deer Island Light. The other three Deer Island outfalls are for temporary use only.

The two main 60" outfalls from Nut Island Treatment Plant extend for a distance of about 6,000 ft. from the Nut Island shore; the third, a 60" outfall, extends about 1,400 ft. from the shore; the fourth, a 60" emergency outfall, extends about 480 ft. from the shore; the fifth, a 12" outfall used for sludge from the treatment plant, discharges at President Roads at the northeasterly end of Long Island, a distance of about 4.2 miles.

The average flow from the Deer Island Treatment Plant and its outfalls has been 295,000,000 gallons of sewage per 24 hours, with a maximum flow of 560,000,000 gallons per 24 hours.

The average flow from the Nut Island Treatment Plant and its outfalls has been 124,000,000 gallons of sewage per 24 hours, with a maximum flow of 261,000,000 gallons per 24 hours.

METROPOLITAN SEWERAGE DISTRICT

Areas and Populations

Table Shows Ultimate Contributing Areas and Present Estimated Populations Within the Metropolitan Sewerage District.

The Population of the Cities and Towns of the District, as given in the Table, is based on the Federal Census of 1980.

<u>City or Town</u>	<u>Area (Square Miles)</u>	<u>Estimated Population</u>
Arlington	4.64	48,219
Ashland	9.40	9,165
Bedford (1)	1.63	13,067
Belmont	3.79	26,100
Boston	39.19	562,994
Braintree	13.44	36,337
Brookline	5.33	55,062
Burlington	8.97	23,486
Cambridge	5.42	95,322
Canton	17.73	18,182
Chelsea	2.06	25,431
Dedham	9.54	25,298
Everett	2.91	37,195
Framingham	22.50	65,113
Hingham (2)	2.50	6,822
Holbrook	4.50	11,140
Lexington	15.77	29,479
Malden	4.23	53,386
Medford	5.98	58,076
Melrose	3.81	30,055
Milton	8.98	25,860
Natick	14.58	29,461
Needham	7.13	27,901
Newton	14.38	83,622
Norwood	10.14	29,711
Quincy	11.39	84,743
Randolph	6.25	28,218
Reading	.01	22,678
Revere	5.55	42,423
Somerville	3.96	77,372
Stoneham	4.22	21,424
Stoughton	14.70	26,710
Wakefield	6.33	24,895
Walpole	19.99	18,859
Waltham	11.38	58,200
Watertown	3.80	34,384
Wellesley	9.89	27,209
Westwood	9.18	13,212
Weymouth	16.22	55,601
Wilmington	15.10	17,471
Winchester	5.31	20,701
Winthrop	1.59	19,294
Woburn	12.23	36,626
<b>TOTALS</b>	<b>404.65</b>	<b>2,056,504</b>

(1) Sewage for part of the town handled through the Town of Lexington under special contract.

(2) The Area and Population given is only for that part of the Town included in the Metropolitan Sewerage District.

METROPOLITAN SEWERAGE DISTRICT

Location, Length and Sizes of Metropolitan Sewers with Public, Special and MDC Connections as of June 30, 1982

City or Town	Size of Sewers	Length in Miles	Public	Special	MDC
Arlington	10" to 66"	10.00	71	252	3
Ashland (4)	--	--	2	0	0
Bedford (6)	--	--	2	0	0
Belmont (1)	30" to 36"	--	2	0	0
BOSTON					
Boston (Proper)	10' to 11'-6"	0.43	2	0	0
Brighton	12" to 7'-0"x9'-4"	9.35	18	4	3
Charlestown	12" to 6'-7"x7'-5"	3.48	15	20	0
Deer Island	4' to 11'-6"	4.46	4	2	2 (3)
Dorchester	2'-6"x2'-7" to 3'-4"	2.90	19	13	1
East Boston	12" to 10'-0"	6.78	26	10	0
Hyde Park	30" to 10'-7"x11'-7"	4.73	20	8	0
Roxbury	3'-9" to 10'-0"	5.66	18	7	0
South Boston	10'-0" to 11'-6"	5.39	2	0	1
West Roxbury	12" to 9'-3"x10'-2"	10.35	36	22	2
Braintree	3" to 48"	4.26	9	2	0
Brookline	8" to 9'-0"	2.93	7	0	0
Burlington (5)	--	--	1	0	0
Cambridge	15" to 7'-4"x11'-6"	12.57	69	23	0
Canton	18" to 60"	7.82	17	32	0
Chelsea	15" to 11'-3"x11'-3"	6.33	30	11	1
Dedham	18" to 72"	3.38	17	3	0
Dover (2)	48"	0.99	0	1	0
Everett	52" to 11'-3"x11'-3"	5.49	12	7	1
Framingham (1)	42"	0.01	3	0	0
Hingham	12" to 24"	0.14	1	0	0
Holbrook	24" to 30"	1.52	2	0	0
Hull (2)	12" to 60"	2.58	0	0	0
Lexington	15" to 33"	2.44	9	0	0
Malden	15" to 4'-6"x4'-10"	8.63	74	166	8
Medford	10" to 9'-3"x9'-3"	13.00	44	12	11
Melrose	10" to 4'-6"x4'-10"	6.09	45	145	1
Milton	8" to 11'-0"x12'-0"	7.12	38	4	0
Natick	42" to 48"	5.15	20	4	0
Needham	2"-0"x2'-3" to 54"	8.62	9	12	0
Newton	15" to 72"	5.08	24	26	1
Norwood	30" to 54"	4.67	14	15	0
Quincy	16" to 11'-3"x12'-6"	9.91	46	7	2
Randolph (1)	15" to 33"	0.01	2	0	0
Reading	16" to 63"	0.06	2	0	0
Revere	15" to 48"	0.14	3	0	0
Somerville	10" to 6'-5"x7'-2"	4.73	21	24	3
Stoneham	10" to 36"	4.04	18	5	1
Stoughton (1)	20"	--	1	0	0
Wakefield	12" to 30"	0.70	7	3	0
Walpole	2'-6"x2'-9"	--	2	0	0
Waltham	30" to 42"x48"	1.69	4	0	0
Watertown	12" to 72"	1.47	8	7	0
Wellesley	2'-0"x2'-3" to 48"	0.10	4	0	0
Westwood	30" to 36"	0.30	3	0	0
Weymouth	12" to 4'-9"x5'-0"	3.73	10	6	0
Wilmington (1)	30"	--	2	0	0
Winchester	15" to 5'-6"x5'-9"	14.41	38	28	1
Winthrop	9'-0" to 10'-0"	3.23	16	4	0
Woburn	15" to 4'-2"x4'-5"	5.64	7	9	0
TOTALS		228.0	876	900	42

(1) The Metropolitan Sewers extend but a few feet into the Town of Belmont, Framingham, Randolph, Stoughton, Walpole and Wilmington.

(2) Dover and Hull are not part of the Metropolitan Sewer District.

(3) Temporary.

(4) Ashland connected to MDC through Framingham sewers.

(5) Burlington connected to MDC through Woburn sewers.

(6) Bedford connected to MDC through Lexington sewers.

COLLECTION SYSTEM

PUMPING SERVICE

Capacities and Results for Fiscal Year 1982

Alewife Brook Pumping Station:

At this station, there are three primary, 30" mixed flow pumps driven by 440 volt, three phase, 100 hp, General Electric variable speed motors and one secondary 20" mixed flow pump driven by a 440 volt, three phase, 50 hp, squirrel cage motor.

Contract capacity of 30" pumps .....	26 mgd at 15' head
Contract capacity of 20" pump .....	12 mgd at 17' head
Average quantity pumped per day .....	10,970,000 gallons
Maximum quantity pumped per day .....	30,500,000 gallons

Alternating current is furnished by the Boston Edison Company and the Town of Belmont.

Braintree-Weymouth Pumping Station:

At this station, there are three diesel engine driven horizontal centrifugal pumps. The Waukesha diesel driven pump is capable of lifting 20 mgd against a head of 42 feet, the Enterprise diesel driven pump is capable of lifting 20 mgd against a head of 40 feet and a Chicago pneumatic diesel driven pump is capable of lifting 20 mgd against a head of 42 feet.

Average quantity pumped per day .....	22,820,000 gallons
Maximum quantity pumped per day .....	51,800,000 gallons

Charlestown Pumping Station:

At this station, there are three submerged centrifugal pumps being driven by Fairbanks-Morse diesel engines.

Contract capacity of one diesel engine driven pump ...	60 mgd at 18' head
Contract capacity of two diesel engine driven pumps ..	45 mgd at 11' head
Average quantity raised per day .....	29,140,000 gallons
Maximum quantity raised per day .....	70,050,000 gallons

East Boston Pumping Station:

At this station, there are four submerged centrifugal pumps, three operable, one driven by an Enterprise diesel engine, one by a uniflow type steam engine, and one by a triple expansion steam engine of the Reynolds-Corliss type. The other triple expansion steam engine is being utilized for parts and is not operational at this time.

Contract capacity of diesel engine driven pump .....	100 mgd with 19' head
Contract capacity of uniflow engine driven pump .....	60 mgd with 24' head
Contract capacity of triple expansion engine driven pumps .....	45 mgd with 19' head
Average quantity pumped per day .....	16,390,000 gallons
Maximum quantity pumped per day .....	51,000,000 gallons

East Boston Electric Pumping Station:

This station is equipped with one 400 hp, 396 rpm, General Electric motor that drives a 50 mgd vertical centrifugal non-clog DeLaval pump at a total head of 35.4 feet, and with one 600 hp, 320 rpm, General Electric motor that drives a 75 mgd vertical centrifugal, non-clog DeLaval pump at a total head of 38.5 feet. Alternating current, 4,160 volt, three phase, is furnished by the Boston Edison Company. This station had not been used since 1974, however, during this past year, the 50 mgd pump was reactivated to provide for emergency flow relief during storm flow conditions.

Hingham Pumping Station:

This station is equipped with three Fairbanks-Morse centrifugal pumps driven by 60 hp, Fairbanks-Morse induction type, wound rotor, variable speed motor and its pumping range is from 375 gpm at a head of 35 feet, to 1,000 gpm at a head of 126 feet. Alternating current, 440 volt, three phase, is supplied by the Town of Hingham.

Average quantity pumped per day .....	600,000 gallons
Maximum quantity pumped per day .....	2,050,000 gallons

Hough's Neck Pumping Station:

This station is equipped with two 6" vertical centrifugal pumps capable of pumping 1,000 gpm at a head of 20 feet. The pumps are driven by two 10 hp 220/440 volt, three phase motors. Alternating current 440 volt, three phase is furnished by the Nut Island Sewage Treatment Plant.

Quincy Pumping Station:

The plant at this station consists of two Fairbanks-Morse centrifugal pumps driven by two Fairbanks-Morse diesel engines and one Worthington centrifugal pump driven by an Enterprise Diesel engine.

Contract capacity of Fairbanks-Morse pumps .....	20 mgd at a head of 33'
Contract capacity of Worthington pump .....	12 mgd at a head of 26'
Average quantity raised per day .....	7,940,000 gallons
Maximum quantity raised per day .....	20,650,000 gallons

Reading Pumping Station:

At this station, there are two submerged centrifugal pumps of 4 mgd capacity at a 75 foot head, one driven by a General Electric 100 hp, 440 volt, three phase electric motor and the other driven either by a Fairbanks-Morse 100 hp 400 volt, three phase electric motor or by a standby Fairbanks-Morse diesel engine. Alternating current is furnished by the Town of Reading.

Average quantity pumped per day ..... 2,740,000 gallons  
Maximum quantity pumped per day ..... 4,090,000 gallons

Squantum Pumping Station:

At this station, there are two centrifugal pumps, each capable of pumping 2,800 gpm at a head of 46 feet. One is driven by 60 hp, three phase motor and the other by a 60 hp, three phase motor, or in emergency, by an 80 H. P., Fairbanks-Morse diesel engine. Alternating current is furnished by the Massachusetts Electric Company.

Average quantity pumped per day ..... 890,000 gallons  
Maximum quantity pumped per day ..... 1,353,000 gallons

COLLECTION SYSTEM

COMBINED SEWER OVERFLOW DATA

COTTAGE FARM STORM WATER DETENTION AND CHLORINATION STATION

The Cottage Farm Storm Water Detention and Chlorination Station was activated May, 1971, and is located on the Cambridge side of the Charles River, just west of the Boston University Bridge. Dry weather flows and minor storm flows up to the capacity of the sewer line itself normally pass through the sewer line directly to Ward Street Headworks and then to Deer Island Sewage Treatment Plant. Under storm conditions, when this sewer line capacity is exceeded, flow is retained at the Cottage Farm Station up to a volume of 1.3 million gallons. Any amount in excess of 1.3 million gallons received by the station is screened and chlorinated and discharged to the Charles River. The 1.3 million gallons retained by the station is then pumped into the Ward Street sewer line for future treatment at Deer Island Sewage Treatment Plant, once the flow recedes and sewer line capacity is available to do so. The design flow of the Cottage Farm Storm Water Detention and Chlorination Station is 233.1 million gallons per day.

No. of Times Plant was Activated	70.
Total Amount Received by Station	1,567.72 Million Gallons
No of Times Overflow Occurred into the Charles River	60.
Total Amount of Overflow into the Charles River	1,270.90 Million Gallons
Minimum Recorded Rainfall	0.20 Inches
Maximum Recorded Rainfall	9.0 Inches
Average Rainfall	1.28 Inches

CHARLES RIVER ESTUARY POLLUTION CONTROL FACILITY

This facility is designed to treat combined sewage flow from storms up to a 5-year frequency and pump it to Boston Harbor.

The facility is two phased; a dry weather flow and storm flow pumping station. The dry weather flow phase is a 5 million gallon/day capacity sewage pumping station with discharge to a sewer in Charlestown. The storm phase which includes screens, control gates, detention tanks, and chlorination in a large pumping station with a maximum capacity of 385 million gallon/day and discharges downstream below the New Charles River Dam. The combined flow after screening is chlorinated.

No. of Times Overflowed into Boston Harbor	15
Total Amount of Overflow into Boston Harbor	350. Million Gallons
Minimum Recorded Rainfall	0.20 Inches
Maximum Recorded Rainfall	9.0 Inches
Average Rainfall	1.28 Inches

TYPICAL OPERATIONAL DATA\*

BOD, 5 Day

Influent - ppm	138.
Effluent - ppm	84.
Removal, %	40. %

Suspended Solids

Influent - ppm	180.
Effluent - ppm	106.
Removal, %	42. %

Settleable Solids

Influent - ml/l	2.82
Effluent - ml/l	1.21
Removal, %	53. %

Bacterial Concentration (Total Coliform)

Influent - MF/100 ml	$28.8 \times 10^6$
Effluent - MF/100 ml	$4.3 \times 10^3$
Removal, %	99.98%

\* Based on Composite Samples From Actual Discharges

## PROJECT PLANNING AND MANAGEMENT

The Project Planning and Management Staff is responsible for the overall management of all Sewerage Division planning, design, and construction contracts. Composed of engineers, planners, draftsmen, and clerical staff, this group ensures that contracts are undertaken as needed, are sufficiently supervised to stay on schedule and within budget, and are completed in a timely, professional manner. Tracking systems are in place to aid the project planning and management personnel in the proper monitoring and control of contract milestones, in the expeditious payment of consultant and contractor fees, and in the continuous processing of Federal and State grant requests and reimbursements.

It is the major function of this group to correct immediate operational deficiencies and to coordinate these short-term projects with the long-range needs of the Division in order to guarantee continued reliable functioning of the MDC Sewerage system.

The following section lists the contracts begun or in force during fiscal year 1982.

### Deer Island Sewage Treatment Plant

#### Contract No. S80-0605

Installation of 2,000 Horsepower Electric Motor for Sewage Pump Drive for the Deer Island Sewage Treatment Plant

This contract was awarded on July 16, 1980 to Engineering Construction Inc. of Magnolia, Ma. in the amount of \$226,069.00. The contract started work on July 28, 1980. After numerous delays, the motor was placed into operation in December, 1981. The contract was not accepted as complete by the end of fiscal year 1982.

#### Design of Contract No. S80-0849(S76-1)

Load Lugger System, Three Headworks

This contract was awarded to Whitman & Howard, Inc. Wellesley, Ma. on June 19, 1980 at a total design cost not to exceed \$11,500.00. The contract was signed September 25, 1980 and was accepted as complete on March 3, 1981, for total cost of \$9,571.00.

#### Design of Contract No. S80-0852(S79-10)

Shaft Overflow Containment, Deer Island Sewage Treatment Plant, Boston, Massachusetts

This contract was awarded to Keyes Associates on June 19, 1980 at a design cost not to exceed \$15,000.00. The contract was signed July 17, 1980, and was accepted as complete as of May 19, 1981 for total cost of \$15,000.00.

Construction of Contract No. S80-0852(S79-10)

Shaft Overflow Containment, Deer Island Sewage Treatment Plant, Boston, Massachusetts

The contract was awarded to P.J. Gear, Inc. on October 8, 1981 at a bid price of \$104,113.00. The contract was signed December 3, 1981 and was not completed at the end of fiscal year 1982.

Contract No. S81-0934(R108255/00)

Physical Survey of Portions of M.D.C. Interceptor System Tributary to Deer Island Sewage Treatment Plant

This contract was awarded to Camp Dresser & McKee, Inc. of Boston, Massachusetts on April 23, 1980 at a negotiated price of \$150,937.00. Notice to proceed was given May 19, 1980. It was not completed at the end of fiscal year 1982.

Contract No. S81-0948

Instrumentation Study, All Division Facilities

This consultant contract with Russell H. Babcock P.E. was signed by the Commission April 9, 1981 for a study cost not to exceed \$39,185.00 and was not completed at the end of fiscal year 1982.

Contract No. S81-0951-S1B

Sludge Management Study Update

This contract was awarded to Havens and Emerson, Inc. at a cost not to exceed \$777,300.00 in April, 1980. The contract was signed on December 11, 1980 and the study was not completed at the end of fiscal year 1982.

Design of Contract No. S82-1003

Rehabilitation of Digesters No. 1 & 2, Deer Island Sewage Treatment Plant, Boston Massachusetts

This contract was awarded to O'Brien & Gere Engineers, Inc. Syracuse, New York on September 22, 1981. The total design cost not to exceed \$63,835.00. The contract was signed March 4, 1982 and was not completed at the end of fiscal year 1982.

Contract No. S82-1074

Microwave Study Contract, Deer Island Sewage Treatment Plant and Headworks

This consultant contract with Russell H. Babcock P.E. was signed by the Commission January 7, 1982 for a study cost not to exceed \$18,323.00 and was not completed at the end of fiscal year 1982.

Nut Island Sewage Treatment Plant

Contract No. S80-0656-S1A

Site Options Study, Treatment System

This study contract with Metcalf & Eddy, Inc. of Boston, Massachusetts was signed by the Commission on October 31, 1980 for a total cost not to exceed \$1,369,800.00. The contract work was not completed at the end of fiscal year 1982.

Design of Contract No. S80-0830(S79-26)

Boiler Replacement, Nut Island Sewage Treatment  
Plant, Quincy, Massachusetts

This contract was awarded to Samuel Ussia and Associates, Brookline, Massachusetts, on June 26, 1980, at a design cost not to exceed \$20,250.00. The contract was signed on June 26, 1980 and was accepted as complete on August 28, 1981 for a total cost of \$20,250.00.

Construction of Contract No. S80-0830(S79-26)

Install New Boilers, Nut Island Sewage Treatment Plant

This contract was awarded to Scott Bailey on February 4, 1982 at a bid price of \$187,600.00. The contract was signed March 4, 1982 and was not completed at the end of fiscal year 1982.

Design of Contract No. S80-0850(S77-14)

Rehabilitation of Sludge Transfer System, Nut Island Sewage  
Treatment Plant, Quincy, Massachusetts

This contract was awarded to Hayden, Harding and Buchanan on July 17, 1980. The design cost was not to exceed \$29,600.00. It was completed on July 31, 1981 at a final cost of \$31,250.00.

Construction of Contract No. S80-0850(S77-14)

Rehabilitation of Sludge Transfer System, Nut Island Sewage  
Treatment Plant, Quincy, Massachusetts

This contract was awarded to Cabot Construction Co., Inc., Lexington, Massachusetts, on November 9, 1981 at a bid price of \$83,376.50. The contract was signed January 7, 1982 and was completed on May 28, 1982, at a total cost of \$91,335.81.

Design of Contract No. S80-0853-D1A(S79-17)

Effluent Water Filtration System, Nut Island Sewage Treatment Plant, Quincy, Massachusetts

This contract was awarded to SEA Consultants, Inc. at a design cost not to exceed \$12,130.00 on July 9, 1979. The contract was signed on July 24, 1980 and was not completed at the end of fiscal year 1982.

Construction of Contract No S80-0853-C1A

Installation of Gland Seal Water Backup System, Nut Island Sewage Treatment Plant, Quincy, Mass.

This contract was awarded to Norfolk Plumbing Contractors at a bid price of \$23,600.00. It was signed on July 16, 1981 and was accepted as complete on June 18, 1982 for a total cost of \$23,600.00.

Design of Contract No. S80-0854

Alternate Power Source, Nut Island Sewage Treatment Plant

This contract was awarded to Wright-Pierce Architects, Engineers, Boston, Mass. on September 14, 1981 at a design cost not to exceed \$35,437.00. The contract was signed on May 27, 1982 and was not completed at the end of fiscal year, 1982.

Study of Contract No. S81-0947

Chlorination System Study, Nut Island Sewage Treatment Plant, Quincy, Mass.

This consultant contract with Perkins/Jordan, Reading, Massachusetts was signed by the Commission on June 11, 1981 for a cost not to exceed \$35,524.00 and was accepted as complete as of January 29, 1982 for total cost of \$24,861.83.

Design of Contract No. S81-0947

Chlorination System Modifications, Nut Island Sewage Treatment Plant, Quincy, Massachusetts

This contract was awarded to Perkins/Jordan, Reading, Massachusetts by the Commission on June 10, 1982 for a cost not to exceed \$148,071.00 and was not completed at the end of fiscal year 1982.

Contract No. S82-1008

Study and Design to Secure or Replace Floating Covers on  
Digester 3 and 4 at Nut Island Sewage Treatment Plant

This consultant contract with Tighe & Bond/SCI Consulting Engineers was signed by the Commission March 11, 1982 for study, design and construction services not to exceed \$110,462.00 and was not completed at the end of fiscal year 1982.

Contract No. S82-1088-R1A

Emergency Overhaul, Stud Repair, and Regrout of a Worthington  
EHGO-6 at Nut Island Sewage Treatment Plant, Quincy, Mass.

This contract was awarded on an emergency basis to Creole Production Services, Inc., Houston, Texas on February 28, 1982 at an upset limit of \$200,000.00 which was amended on May 27, 1982 for \$260,000.00. The contract was signed on March 3, 1982, and accepted as complete on June 15, 1982 at a total cost of \$232,893.93.

Contract No. S82-1092-R1A

Major Overhaul, Frame Repair, and Regrout Worthington  
EHGO-6, Units #1 and #2, Nut Island Sewage Treatment  
Plant, Quincy, Massachusetts

This contract was awarded on an emergency basis to Creole Production Services, Inc., Houston, Texas, on May 14, 1982 at an upset limit of \$600,000.00. The contract was signed on May 19, 1982 and was not completed at the end of fiscal year 1982.

Pumping Stations

Contract No. S80-0811-S1A

Study for Relief or Rehabilitation of the Braintree-Weymouth  
Pump Station and Interceptor

This study contract with C.E. Maguire, Inc. of Waltham, Mass. was signed by the Commission on November 5, 1981 for a total cost not to exceed \$397,659.00. The contract was not completed at the end of fiscal year 1982.

Contract No. S80-0824

Masonry and Roof Repair, Charlestown Pumping  
Station, Charlestown, Massachusetts

This contract was awarded to D.J. McCarty Construction Co., West Roxbury, Ma. on July 16, 1981 at a bid price of \$38,230.00. It was signed on August 20, 1981 and not accepted as complete at the end of fiscal year 1982.

Contract No. S80-0828

East Boston Pumping Station Facilities Plan

The consultant contract with Metcalf & Eddy, Inc., Boston, Ma. was signed by the Commission on September 3, 1981 for a study cost not to exceed \$422,570.00. The facilities planning was not completed by the end of fiscal year 1982.

Design of Contract No. S80-0851(S79-6)

Screening Container System, All Sewage Pumping Stations

This contract was awarded to SEA Consultants on September 18, 1980, at a total design cost not to exceed \$39,952.00. The contract was signed on October 17, 1980 and was not completed at the end of the fiscal year 1982.

Contract No. S81-0201

Reading Pumping Station Improvements

The consultant contract with SEA Consultants, Inc. was signed by the Commission on August 27, 1981 for a study cost not to exceed \$328,062.00. The study was not completed by the end of fiscal year 1982.

Contract No. S81-0952(S80-6)

Emergency Repairs to the Charlestown Pumping Station  
Charlestown, Massachusetts

This contract was awarded on an emergency basis on December 30, 1980 to the Perini Corporation, Framingham, Mass. at an upset limit of \$250,000.00. It was signed December 23, 1980 and was accepted as complete on May 4, 1981 for a total cost of \$138,705.71.

Combined Sewer Overflow

Contract No. S78-0651

Facilities Planning for the Control of Combined Sanitary Sewage  
and Stormwater discharge in Boston Harbor and its Tributary Rivers

This contract was awarded to Camp Dresser and McKee, Inc. of Boston, Mass. for the Dorchester Bay area. CDM was also lead consultant for the entire C.S.O. Facility Plan. The consultant started work on June 14, 1978 and the work is ongoing. The initial contract price was \$1,440,480.00.

Contract No. S78-0652

Facilities Planning for the Control of Combined Sanitary Sewage and Stormwater Discharge into Boston Harbor and its Tributary Rivers

This contract was awarded to O'Brien & Gere Engineers, Inc. of Syracuse, New York, for the Inner Harbor area. The consultant started work on June 15, 1978 and the work is ongoing. The initial contract price was \$1,415,870.00.

Contract No. S78-0653

Facilities Planning for the Control of Combined Sanitary Sewage and Steamwater Discharge into Boston Harbor and its Tributary Rivers

This contract was awarded to Metcalf & Eddy Inc. of Boston, Mass. for the Charles River Basin area. The consultant started work on June 15, 1978 and the work is ongoing. The initial contract price was \$1,118,855.00.

Contract No. S80-0874

Old Stony Brook Conduit Connection to the Boston Main Drainage Relief Sewer and the Goldsmith Brook Conduit Relocation, also, Assistance to the MBTA for Design of a Force Main Crossing the Southwest Corridor at Gordon Street

This contract was awarded July 2, 1980 to Metcalf and Eddy, Inc., Boston, Ma. at a design cost of \$267,579.00 which was amended on April 2, 1981 to read \$273,346.00. It was not completed at the end of fiscal year 1982. Construction Bid as part of MBTA project. Awarded to Cruz Construction Co.

Interceptors

Contract No. S76-0199(S77-1)

Installation of Twin 54" Sewer Lines, Weymouth Fore River

This contract was awarded to J.F. White Contracting Company, Newton, Massachusetts on December 1, 1977 at a bid price of \$3,932,610.00. It was signed on January 12, 1978 and accepted as complete as of August 20, 1981 for total cost of \$3,894,906.30

Contract No. S78-1

This Project is Included Under New Contract # S76-0199

Underwater Services, Weymouth-Force River, Weymouth and Quincy, Massachusetts

The contract was awarded to Inner Space Services of Methuen, Massachusetts on August 24, 1978 at a bid price of \$57,999.75. It was signed on November 9, 1978 and was accepted as complete as of September 1, 1981 for total cost of \$79,768.39.

Contract No. S79-0655-S1A

Study for the Relief of the Framingham Extension Sewer

This study contract with Anderson-Nichols/Hazen and Sawyer (Joint Venture) was signed by the Commission on November 30, 1978 for a total cost not to exceed \$285,775.00. The contract work was not completed at the end of fiscal year 1982.

Contract No. S80-0738

Site Study for Proposed South Maintenance Facility

The consultant contract with Robert N. Glassman Associates, Inc. was signed by the Commission on April 3, 1981 for a study cost not to exceed \$36,000.00 and was accepted as complete on December 15, 1981 at a total cost of \$36,000.00.

Contract No. S81-0893-S1A

Study for the Relief of the Wellesley Extension Sewer

This study contract with SEA Consultants, Inc. of Boston, Ma. was signed by the Commission on February 5, 1981 for a total cost not to exceed \$324,948.00. The contract was not completed at the end of fiscal year 1982.

Contract No. S81-0938

Millbrook Valley Relief Sewer Design

The consultant contract with Weston & Sampson Engineers, Inc. was signed by the Commission on October 22, 1981 for a design cost not to exceed \$193,428.00. Amendments I and II, signed on May 13, 1982 and August 12, 1982, respectively, increased the design cost to \$255,902.00 and then to \$269,058.00. Design was not completed by the end of fiscal year 1982.

Design of Contract No. S82-1001

Design of Reconstruction of Two Reinforced Concrete  
Underground Sewerage Structures, Somerville and Medford  
Massachusetts

This contract was awarded to D. Baugh & Associates, Inc. on September 5, 1981. The total design cost not to exceed \$13,812.00. The contract was signed February 5, 1982 and was not completed at the end of fiscal year 1982.

Industrial Waste

Contract No. S78-0657

Secondary Waiver Application

This contract was awarded to Metcalf and Eddy, Inc. of Boston, Ma. on May 17, 1978 at a study cost not to exceed \$440,000.00. It was amended on June 7, 1979, to read \$935,778.00. The latest amendment, developed to answer additional EPA requirements was signed on January 21, 1982 at a cost not to exceed \$450,000.00. Projected completion is scheduled for November, 1982.

Contract No. S78-0658(R108171/00)

Establish Municipal/Industrial Permit System and to Conduct Industrial Waste Survey and a Pretreatment Program and to Establish and Develop User Charge and Industrial Cost Recovery Systems to Comply with Federal Law and Related Rules and Regulations.

This contract was awarded to Black and Veatch, Consulting Engineers of Kansas City, Mo. on July 13, 1978 at a bid price of \$2,179,500.00 which was last amended on March 19, 1981 to read \$2,182,700.00. It was signed on August 3, 1978. Notice to proceed was given September 8, 1978. The ongoing contract was not completed at the end of the fiscal year 1982.

Contract No. S82-0930

Laboratory Service for Industrial Waste

This consultant contract with the G.C.A. Corporation, Bedford, Massachusetts was signed by the Commission May 14, 1981 for a study cost not to exceed \$399,880.00. Due to budget cuts final cost of the contract was \$164,886.52.

## INDUSTRIAL WASTE PROGRAM

### Industrial Inspections

The Industrial Waste Program was officially started in February of 1973 to acquire data on all industries within the 43 cities and towns which make up the district. The information requested on each industry inspected is a requirement of the NPDES Permits issued by the Environmental Protection Agency and State Division of Water Pollution Control to the Commission for Deer and Nut Island Sewage Treatment Plants.

The inspection program involves physical inspection of all industries in the district. Industries suspected of discharging a questionable waste are required to submit the results of analyses performed on representative samples of the process waste by an independent laboratory for review and evaluation. The results of analyses along with other pertinent information - (permit application, inspection reports on the industry) - are used to determine whether or not the wastes are acceptable to continue discharge into the Metropolitan District Commission sewer system.

Inspection of all known industries that are within the 43 cities and towns which make up the Sewerage District have been completed to date. Some of the industries within these areas are not connected to the sanitary sewer system at this time; however, these industries were inspected so that a complete record of potential discharges into the sanitary sewer system is available.

As a result of the information obtained by the questionnaire survey and expanded industrial inspection program, 6000 industries have been inspected, 642 of which were originally found to be in violation of Metropolitan District Commission's Rules and Regulations..., and are now presently pretreating, implementing pretreatment and/or modifying their system or processes to comply with the established standards.

A random follow up inspection program has been instituted to insure that industries previously cited by the Division are either conforming to commission requirements or are progressing towards this goal.

All gathered information has been encoded into a computer retrieval system enabling recall of the data in various forms. The data is useful for tracing the source of large spills, notifying the industries of the issuance of Federal categorical standards, and supplying water consumption figures, as well as generating several detailed reports such as the Semi-Annual Industrial Waste Report submitted to Environmental Protection Agency and Massachusetts Division of Water Pollution Control.

In addition, the vast amount of computerized data can be used for other various programs throughout the Commonwealth such as hazardous waste, water usage, water planning, and economic planning for industrial development. However, all of the long-term benefits resulting from utilization of the computerized data management system and its potential application to other areas of interest have yet to be determined.

Mutual cooperation between the Metropolitan District Commission and industry has been the general rule. Among the thousands of industries investigated thus far, only a few have shown complete resistance to eliminating troublesome or toxic substances from the sewers, and in these cases the Metropolitan District Commission has taken legal action through the office of the Attorney General of the Commonwealth. The results were fines ranging upward to \$20,000 and agreements for judgement stipulating adherence to strict implementation schedules under threat of further penalties.

#### Industrial User Discharge Permits

The industrial permit program is mandated as a result of the promulgation on August 3, 1978 of the Metropolitan District Commission Sewer Use Rules and Regulations.

The issuance of the industrial user discharge permit does not necessarily mean the industry is discharging an acceptable waste. In the case of an industry in violation of regulations, the permit would contain specific conditions as set forth by the Metropolitan District Commission that the industry must meet within a designated time frame. All permits require that changes in an industry's location, waste strength, or flow as well as any accidental discharges of prohibited or controlled material be reported to the Metropolitan District Commission.

The Metropolitan District Commission has classified industries into four categories according to the nature of their wastes. The categories are as follows:

1. industries requiring pretreatment
2. industries which have some toxic discharges but do not require pretreatment
3. industries which have non-toxic discharges in addition to sanitary flow
4. dry industries or industries with sanitary flow only

As of now, these are the number of permits that have been issued by category: Category 1 - 699, Category 2 - 463, Category 3 - 679, Category 4 - 2853.

#### Industrial Monitoring

The industrial monitoring program was developed to maintain an inventory of the industrial wastes currently entering the system and to eliminate unacceptable concentrations of toxic and potentially deleterious substances. It involves sample collection by Metropolitan District Commission personnel and analysis of these industrial wastewater samples by independent laboratories. The results of the analyses, in conjunction with information compiled in the inspection and permit programs, further assists in the determination of the acceptability of wastewater discharge. GCA/Technology was awarded the contract to assist the Metropolitan District Commission in its Industrial Waste Monitoring Program by

providing laboratory services for the analysis of industrial wastewater samples including such parameters as metals, volatile organics, pesticides, PCBs, base/neutral and acid extractable priority pollutants.

This random monitoring by the Metropolitan District Commission is in addition to self monitoring by the industries as required in the industrial user discharge permits.

Gasoline in Public Sewers

A Sanitary Engineer is employed to inspect all newly constructed garages or other gasoline-using establishments to insure proper separators are installed and maintained. Occasionally, odors of gasoline are detected in the sewer and reported to the Department of Public Safety. A joint investigation and follow-through are made to eliminate this hazard.

During the fiscal year, 22 new separators were connected to the local sewers that discharge into the Metropolitan System and one was disconnected. There are according to our records 4,644 separators in service at garages and other gasoline-using establishments.

## SEPTAGE WASTE POLICY

The disposal of septage waste has become increasingly complicated because of population growth and more strict disposal methods.

Present Metropolitan District Commission Sewerage Division policy limits all septage disposal privileges to member communities, and certain non-member communities under special contract.

The contractual agreements are issued on a yearly basis by the Metropolitan District Commission and require annual renewal. In addition, yearly acceptance is contingent upon receipt of progress reports at six month intervals outlining progress towards implementation of an acceptable alternate septage disposal method.

A septic tank waste monitoring program was conducted in selected towns to obtain the primary goal of categorizing septage waste and establishing certain parameter ranges including BOD, total suspended solids, and chlorine demand. This program also gave the Metropolitan District Commission the opportunity to randomly check to see if wastes of an industrial nature were being deposited in the septic tank disposal sites. As a result, some towns were requested to institute a procedure at the disposal site so as to aid the Metropolitan District Commission in eliminating industrial type discharge at these locations.

S.E.A. Consultants, Inc. was awarded the contract to conduct a Septage Management Study. The study will develop a management plan for the future, this is to include technical feasibility, capital, operation and maintenance costs and ease of implementation. Management strategies will include Metropolitan District Commission or community operated receiving facilities, market potential for privately operated facilities, inclusion/exclusion of non-member communities and user fee structures.

## TREATMENT SYSTEMS

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ROBERT J. HOLTHAUS, DIRECTOR

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## N U T   I S L A N D   S E W A G E   T R E A T M E N T   P L A N T

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JAMES W. CONNELL, SUPERINTENDENT

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The Nut Island Sewage Treatment Plant, in operation since 1952, presently serves twenty-one cities and towns, including portions of Boston, Brookline, Hingham, Milton and Newton, covering an area of 236.83 square miles, having a total population of 750,019 and a contributing population of 629,553. Five Metropolitan District Commission pumping stations are located throughout the contributing area.

Designed to remove floating solids and grease and reduce the amount of suspended solids to such an extent as can be done in sedimentation tanks having 90 minutes detention, the plant has been operating effectively as the first completed treatment unit in the Metropolitan District Commission Sewerage Division.

The treatment processes include pre-chlorination, coarse screening and grit removal for incineration, a pre-aeration of the influent for a 20-minute period, primary sedimentation and post-chlorination of plant effluent prior to discharge through 60" outfall pipes some 6,000 feet off shore in deep tidal water.

Treatment of the raw sludge is accomplished by modified high rate digestion. Two primary tanks, which have fixed covers, and two secondary tanks with floating covers are equipped to maintain continuous recirculation of the tank contents. The digested sludge is disposed of through a 12" submarine pipe line which extends a distance of 4.2 miles from the treatment plant into deep tidal water on the south side of President Roads.

Gas produced by the digestion process is the principal source of fuel for all plant power and heating purposes.

TO NUT ISLAND

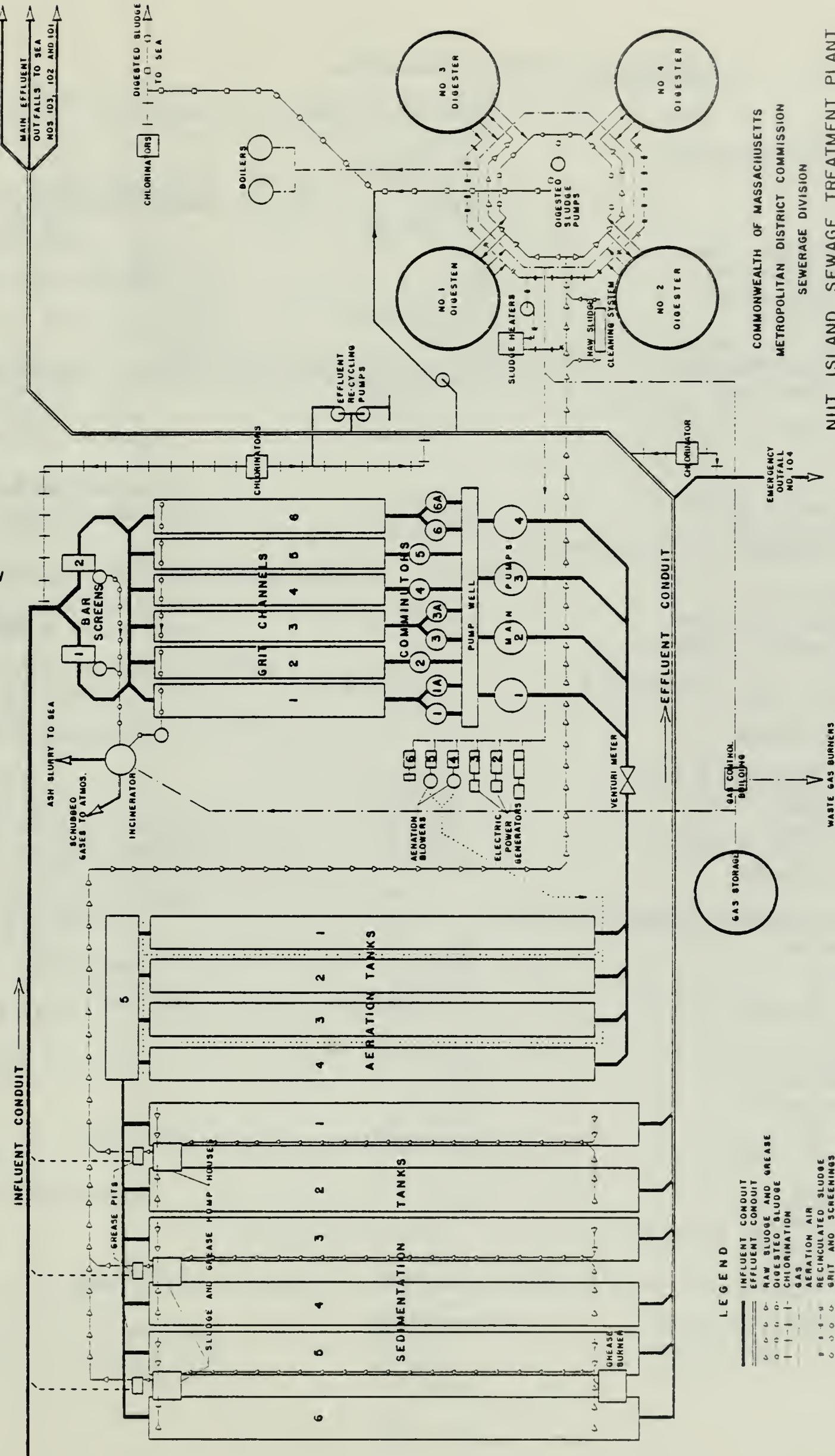
THE TOTAL AND CONTRIBUTING POPULATIONS ALONG WITH THE ULTIMATE SEWERED AREA  
OF EACH CITY OR TOWN CONTRIBUTING TO NUT ISLAND SEWAGE TREATMENT PLANT AS  
OF SEPTEMBER, 1982, ARE TABULATED BELOW

CITY OR TOWN	TOTAL POPULATION 1980 FEDERAL CENSUS	CONTRIBUTING POPULATION	ULTIMATE SEWERED AREA SQUARE MILES
Ashland	9,165	2,933	9.40
Boston (Part of)	144,126	143,981	16.96
Braintree	36,337	35,610	13.44
Brookline (Park of)	21,419	21,312	3.95
Canton	18,182	11,891	17.73
Dedham	25,298	21,225	9.54
Framingham	65,113	52,807	22.50
Hingham	6,822	5,268	2.50
Holbrook	11,140	991	4.50
Milton (Part of)	23,713	22,219	8.56
Natick	29,461	21,507	14.58
Needham	27,901	23,883	7.13
Newton (Part of)	47,079	45,996	8.11
Norwood	29,711	29,562	10.14
Quincy	84,743	84,319	11.39
Randolph	28,218	20,825	6.25
Stoughton	26,710	12,046	14.70
Walpole	18,859	5,695	20.16
Wellesley	27,209	23,427	9.89
Westwood	13,212	5,747	9.18
Weymouth	55,601	38,309	16.22
 TOTALS	 750,019	 629,553	 236.83

# FLOW DIAGRAM

NUT ISLAND SEWAGE TREATMENT PLANT

COMMONWEALTH OF MASSACHUSETTS  
METROPOLITAN DISTRICT COMMISSION  
SEWERAGE DIVISION



Summary of Operational Data

July 1, 1981 to June 30, 1982

## I-SEWAGE FLOW PROCESS

<u>FLOWS</u>	<u>MGD</u>	<u>Cu.METERS/day</u>
minimum hourly rate	30	113.55 K cu.m/day
minimum 24 hour rate	56	211.96 K
average daily rate	124.62	471.69 K
design rate	112	424 K
maximum 24 hour rate	261.40	989.40 K
Design hourly maximum	230	871. K
Total for the year	45,390 M.gals	171.8 M cu.m/year

REMOVALS

## Grit:

Removed, Cu.Ft. total	21,486	608.48 cu. meters
Cu.Ft./MG	0.47	3.54 cu.m/M cu. m

Volatile content as collected, %

17.5 %

## Screenings:

Removed, Cu. Ft. total	23,528	666.31 cu. m
cu.Ft./ M gals	0.52	3.88 cu m/ M cu. m

Incinerator Ash, % Volatile

0.0 %

## II-Daily Average

## Suspended Solids:

Influent-ppm	108.7	
Effluent-ppm	45.9	
Removal, %	57.8 %	
Removal, lbs/day	65,270	29,606.5 kg

## Grease, Petroleum Ether Solubles:

Influent-ppm	48	
Effluent	36.2	
Removal, %	24.6 %	
Removal, lbs/day	12,264 lbs	5563 kg

## Settleable Solids:

Influent- ml/l	6.0	
Effluent- ml/l	0.6	
Removal, %	90.0 %	
Removal, lbs/day	56,124 lbs	25458 kg

## BOD, 5 days:

Influent--mg/l	100	
Effluent--mg/l	82	
Removal, %	18 %	
Removal, lbs/day	18,708	8,486 kg

Bacterial Concentration:

Influent, Total Coliform/ 100 mls	23,000,000
Effluent, Total Coliform/ 100 mls	2,366
% Kill	99.989 %
Influent, Fecal Coliform/ 100 mls	775,000
Effluent, Fecal Coliform/ 100 mls	135
% Kill	99.982 %

Chlorine Requirement:

Effluent-- ppm	5.5 mg/l
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Chlorine Usage: (Total including Pre, Post and Harbor Line usage)

Applied, mg/l	7.6 mg/l
Average daily tons	3.95
Total yearly tonnage	1441.8
	3,584 kg
	1,308,044 kg/ year

Chlorine Residual:

Effluent-ppm	1.5 ppm
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### III- SLUDGE COLLECTION AND DIGESTION PROCESSES

Raw Sludge

Total solids content % after primary settling	5.71
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Added to Digesters

1000 gallons	80,661	305 K cu meters.
1000 dry lbs	38,412	17,424 K kg
Volatile Solids content,%	77.2 %	
Volatile Solids, 1000 dry lbs	29,654	13,451 K kg

Grease, skimmings excluded, pet.ether soluble content,%	15.8 %
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Added to Digesters

1000 dry lbs	6133	2782 K kg
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Alkalinity pH	680 mg/l	
	5.4	

Sand Content, %	13.8 %
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Added to Digesters

1000 dry lbs	5300	2404 K kg
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Digested Sludge: (mass balance of digested sludge, scum, and bottom samples)

Total Solids, %	2.23 %
Withdrawn, 1000 gallons	78,602
Withdrawn, 1000 dry lbs	14,174
Volatile Solids Content, %	52.8 %
	298 K cu. meters
	6429 K kg

## Digested Sludge, Continued

Vol. Solids Withdrawn	7,484 K lbs	3,395 K kg
Grease, pet.ether solubles	7.2 %	
Grease Withdrawn	1064 K lbs	483 K kg
Sand Content, %	32.0 %	
Sand Withdrawn	4757 K lbs	2,158 K kg
Alkalinity	2740 mg/l	
pH	7.22	

## Digestion Efficiency:

### Reduction:

Total Solids Destroyed	51.7 %	
1000 dry lbs	19,934 K lbs	9042 K kg
Volatile Solids Destroyed	66.7 %	

## Digester Scum Withdrawn

Solids, 1000 lbs	2034 K lbs	923 K kg
Grease, 1000 lbs	399 K lbs	181 K kg
Non-saponifiable	168 K lbs	76 K kg

## Digester Loadings:

### Detention Time; designed time:

# 1 Digester and # 3 Digester:	27 days
# 2 Digester and # 3 Digester:	22 days

Estimated Detention times for the primary units and secondary unit based on Raw Sludge feedings, sludge withdrawals and estimated working volume:

# 1 Digester	24 days and # 3 Digester	37 days
# 2 Digester	21 days and # 3 Digester	34 days

Unit Loading rates for the individual digesters: Solids Loadings

# 1 Digester	0.136 dry lbs/cu. Ft/day	2.18 dry kg/cu. m/day
# 2 Digester	0.169 dry lbs/cu. Ft/day	2.71 dry kg/cu. m/day
# 3 Digester	0.040 dry lbs/cu. Ft/day	0.64 dry kg/cu. m/day

# 1 Digester	0.105 Vol. dry lbs/cu. Ft/day	1.68 Vol. dry kg/cu. m/day
# 2 Digester	0.130 Vol. dry lbs/cu. Ft/day	2.08 Vol. dry kg/cu. m/day
# 3 Digester	0.031 Vol. dry lbs/cu. Ft/day	0.50 Vol. dry kg/cu. m/day

### Volatile Solids Loadings:

# 1 Digester	0.105 Vol. dry lbs/cu. Ft/day	1.68 Vol. dry kg/cu. m/day
# 2 Digester	0.130 Vol. dry lbs/cu. Ft/day	2.08 Vol. dry kg/cu. m/day
# 3 Digester	0.031 Vol. dry lbs/cu. Ft/day	0.50 Vol. dry kg/cu. m/day

## Digester Sludge Gas

Total Produced (lab estimates)	280,692 K cu.Ft	7949 K cu. meters
Cu. ft/lb of solids added	7.51	
Cu. m/ kg of solids added	0.47	
Cu. ft/lb of volatile solid	9.71	
Cu. m/ kg of V.S.added	0.61	
Cu.Ft/ lb of solid destroyed	13.77	
Cu. m/ kg destroyed	0.86	
Gas Quality: 61.8 % Methane	38.1 % Carbon Dioxide	
Hydrogen Sulfide, grains/100 cu.ft	55 grains	

## Soda Ash Usage:

Total for the year	25 tons
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TREATMENT SYSTEMS

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ROBERT J. HOLTHAUS, DIRECTOR

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DEER ISLAND SEWAGE TREATMENT PLANT

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STEVE J. KRUGER, SUPERINTENDENT

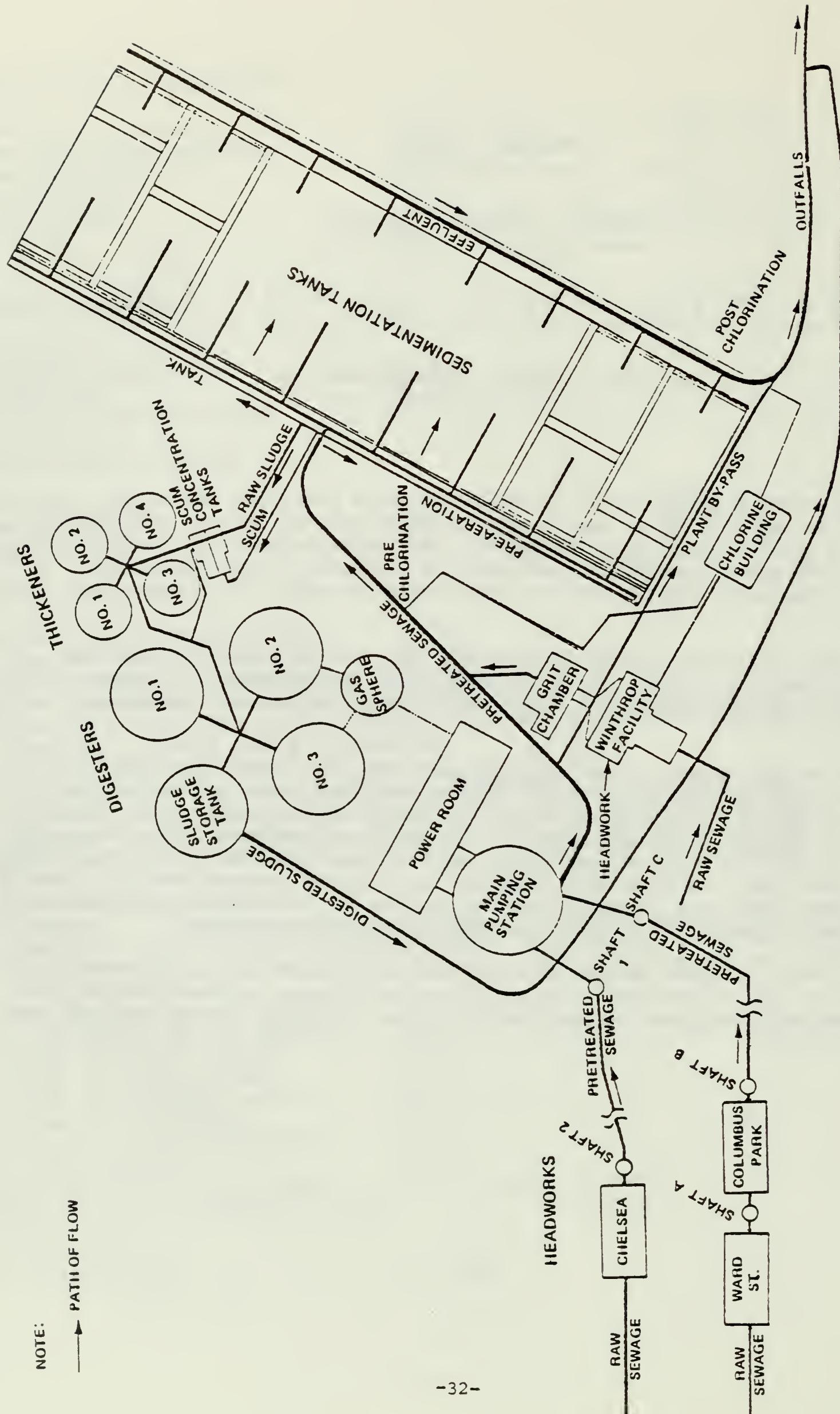
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The Deer Island Treatment Plant, in operation since June 1968, serves 22 communities and portions of Boston, Brookline, Newton, and Milton. The area served by this treatment plant is 168.03 square miles with a total population of 1,306,485 and a contributing population of 1,248,472. Five Metropolitan District Commission pumping stations are located throughout the contributing area.

This primary pollution control facility has been a major factor in improving the water quality in Boston Harbor by effectively accomplishing the design criteria of primary sedimentation and post-chlorination of clarified sewage effluent.

As shown in the diagram on the following page, the Deer Island Facilities includes three (3) remote headworks, located respectively in Chelsea, Roxbury and South Boston, and connected to the Deer Island main pumping station by two deep rock tunnels. The tunnel from the Chelsea Creek Headworks is approximately four miles and the one from Ward Street and Columbus Park Headworks is approximately seven miles long. An additional Facility, the Winthrop Terminal Facility, located on the main plant site, provides sewerage service for local areas and is connected to the Deer Island Plant through a separate direct pump discharge.

The treatment processes include screening and grit removal (at all headworks); aeration of the influent for a ten minute period; primary sedimentation and post-chlorination of the plant effluent prior to ocean discharge through two long submerged outfalls.



Treatment of raw sludge is accomplished by separate sludge thickening prior to high rate digestion. Three primary digesters, equipped with fixed covers, external heaters, and draft tube mixers, have a sludge recirculation system via a common manifold. A fourth digester, also equipped with a fixed cover and a separate liquid recirculation system serves as a storage tank, receiving all primary digested solids and overflow to allow controlled discharge of digested material to sea only during the periods of outgoing tides.

Plant design and construction were under the jurisdiction of the Metropolitan District Commission Engineering Division. The Metropolitan District Commission Sewerage Division is responsible for plant operation and maintenance.

#### FISCAL 1982

#### HIGHLIGHTS OF MAJOR ACTIVITIES

This is the thirteenth full year of operation.

The use of effluent as process water has been continuous for this year.

No. 1 Digester has been secured for inspection, cleaning and maintenance.

Personnel staffing for the 24 hour/day continuous operation of the plant facilities are as follows:

<u>OPERATIONS</u>		
	Pre-Treatment (Headworks):	50
	Primary Treatment (Main Plant):	26
	Power & Pumping (Main Plant):	19
<u>MAINTENANCE</u>		
	Treatment Units:	26
	Power & Pumping Units:	31
<u>OFFICE</u>		
	Clerical:	2
	Laboratory:	4
	Administration & Engineering:	5
<u>TOTAL</u>	As of October 20, 1982	163

Approximately 200 visitors were given conducted tours of the plant this year. Any organization is welcome and requests from groups representing local, national and international associations are becoming more frequent as the concern for the environment grows.

TO DEER ISLAND

THE TOTAL AND CONTRIBUTING POPULATIONS ALONG WITH THE UNTIMATE SEWERED AREA OF EACH CITY OR TOWN CONTRIBUTING TO DEER ISLAND SEWAGE TREATMENT PLANT AS OF SEPTEMBER, 1982, ARE TABULATED BELOW

CITY OR TOWN	TOTAL POLULATION 1980 FEDERAL CENSUS	CONTRIBUTING POPULATION	ULTIMATE SEWERED AREA SQUARE MILES
Arlington	48,219	47,438	4.64
Bedford	13,067	6,886	1.63
Belmont	26,100	25,317	3.79
Boston (Part of)	418,868	416,198	22.23
Brookline (Part of)	33,643	33,475	1.38
Burlington	23,486	19,376	8.97
Cambridge	95,322	94,845	5.42
Chelsea	25,431	25,304	2.06
Everett	37,195	37,009	2.91
Lexington	29,479	25,352	15.77
Malden	53,386	53,119	4.23
Medford	58,076	57,786	5.98
Melrose	30,055	29,905	3.81
Milton (Part of)	2,147	1,908	0.42
Newton (Part of)	36,543	35,535	6.27
Reading	22,678	18,210	9.02
Revere	42,423	40,514	5.55
Somerville	77,372	76,985	3.96
Stoneham	21,424	21,124	4.22
Wakefield	24,895	24,571	6.33
Waltham	58,200	57,909	11.38
Watertown	34,384	34,212	3.80
Wilmington	17,471	210	15.13
Winchester	20,701	18,507	5.31
Winthrop	19,294	19,198	1.59
Woburn	36,626	27,579	12.23
<b>TOTALS</b>	<b>1,306,485</b>	<b>1,248,472</b>	<b>168.03</b>

SUMMARY OF OPERATIONAL DATA

July 1, 1981 to June 30, 1982

I - SEWERAGE FLOW PROCESS:

Headworks - Pretreatment

<u>Flows</u>	<u>Chelsea Creek</u>	<u>Columbus Park</u>	<u>Ward Street</u>	<u>Winthrop Facility</u>	<u>Total</u>
<b>Minimum Hourly Rate</b>					
MGD	30	25	25	0	
Cu. Meters/day	114K	95K	95K	0	
<b>Minimum 24 Hour</b>					
MGD	54	32	63	4	
Cu. Meters/day	204K	121K	238K	15K	
<b>Average Daily</b>					
MGD	126	56	97	16	295
Cu. Meters/day	477K	212K	367K	60K	1116K
<b>Average Daily (Design)</b>					
MGD	(140)	(66)	(113)	(24)	(343)
Cu. Meters/day	530K	250K	428K	91K	1298K
<b>Maximum 24 Hour</b>					
MGD	258	79	170	53	
Cu. Meters/day	976K	299K	643K	200K	
<b>Maximum Hourly Rate</b>					
MGD	280	130	200	100	
Cu. Meters/day	1060K	492K	757K	378K	
<b>Maximum Hourly Rate (Design)</b>					
MGD	(350)	(182)	(256)	(60)	
Cu. Meters/day	1325K	689K	969K	227K	
<u>FLows</u>	<u>Chelsea Creek</u>	<u>Columbus Park</u>	<u>Ward Street</u>	<u>Winthrop Facility</u>	<u>Total</u>
Total for Year - Mil. Gal.	46,221	20,440	35,309	5,811	107,781
Cu. Meters	175M	77M	134M	22M	408M

<u>REMOVALS</u>	<u>Chelsea Creek</u>	<u>Columbus Park</u>	<u>Ward Street</u>	<u>Winthrop Facility</u>	<u>Total</u>
Grit:					
Cu. Ft.	15,341	5,561	17,205	2,465	40,572
Cu. Meters	434	157	487	70	1149
Cu.Ft./M. Gal.	0.33	0.27	0.49	0.42	0.38
Cu.Meters/M.Cu.Met.	2.49	2.04	3.63	3.18	2.82

#### Screenings:

Cu. Ft.	33,818	10,875	36,785	5,740	87,668
Cu. Meters	958	308	1042	162	2483
Cu.Ft./M. Gal.	0.73	0.53	1.04	0.99*	0.81
Cu.Meters/M.Cu.Met.	5.47	4.0	7.78	7.36*	6.09

#### Main Plant - Primary Treatment

<u>Flows</u>	<u>MGD</u>	<u>Cu. Meters/day</u>
Minimum Hourly Rate.....	120.....	454K.....
Minimum 24 Hour.....	199.....	753K.....
Average Daily.....	295.....	1116K.....
Average Daily (Design).....	343.....	1298K.....
Maximum 24 Hour.....	479.....	1812K.....
Maximum Hourly Rate.....	540.....	2043K.....
Maximum Hourly Rate (Design).....	925.....	3500K.....
Total For Year.....	107,781 M. gals.....	408M cu. meters.....

\*Includes amounts from dewatering sed. tanks  
 K - denotes units of  $10^3$   
 M - denotes units of  $10^6$

#### Suspended Solids

Influent - ppm .....	160
Effluent - ppm .....	90
Removal, % .....	44
Removal, lbs/day.....	172,000.....78,000kg

#### Settleable Solids

Influent - ml/l.....	5.8
Effluent - ml/l.....	1.6
Removal, % .....	72

## OD, 5 Day

nfluent - ppm .....	131
ffluent - ppm .....	92
removal, % .....	30
removal, lbs/day.....	95,800.....43,500kg

## bacterial Concentration

nfluent - Total Coliforms/100 ml.....	26,000,000
ffluent - Total Coliforms/100 ml.....	485
% Kill.....	99.998

## chlorine Requirement

nfluent - ppm ..... 4.8

ote: The chlorine requirement fluctuates greatly because of significant salt water infiltration occurring at high tides.

## chlorine Usage

plied - ppm .....	6.7
verage Daily, tons .....	8.23.....7470 kg
otal for year, tons .....	3,003.....2725K kg

## chlorine Residual

ffluent - ppm ..... 0.7

## I SLUDGE COLLECTION AND DIGESTION PROCESS

### Raw Sludge

total solids content % after thickening ..... 6.7

### Added to Digesters

1000 gallons .....	94,133.....356k Cu. Meters
1000 dry lbs. ....	52,537.....23,830k kg

Volatile solids content, % .....

Volatile solids content, % .....

Volatile solids content, 1000 dry lbs. ....37,301 .....16,920K kg

alkalinity - ppm .....

.....1100

.....6.0

### Digested Sludge

Total solids content, % .....	3.9	
Withdrawn, 1000gals. ....	102,767 .....	389k Cu. Meters
Withdrawn, 1000 lbs. ....	33,386 .....	15,144K kg
Volatile solids content % .....	47	
Withdrawn, 1000 dry lbs. ....	15,691 .....	7,118K kg
Alkalinity as calcium carbonate - ppm .....	2,500	
P .....	6.6	

### Digestion Efficiency

#### Reduction

Total solids destroyed % .....	36
1000 dry lbs. ....	19,151
	8687K kg

Volatile solids destroyed % .....	58
1000 dry lbs. ....	21,610
	9,802K kg

#### Digester Loadings

Based upon operation using two (2) primary tanks (4.3 M Gal. capacity)

Detention Time, Days .....	15.4
Unit Loading rate, dry lbs./ cu. ft./ day.....	0.25
kg/ cu. meter/ day .....	4.05

#### Lime Usage

Total for year (tons) .....	nil
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POPULATIONS USED FOR ASSESSMENTS PREPARED SEPTEMBER 1982

<u>CITY OR TOWN</u>	<u>1980 FEDERAL CENSUS</u>	<u>PER CENT POPULATION CONTRIBUTING</u>	<u>CONTRIBUTING POPULATION</u>
Arlington	48,219	9838	47,438
Ashland	9,165	3200	2,933
Bedford	13,067	5270	6,886
Belmont	26,100	9700	25,317
Boston	562,994	9950	560,179
Braintree	36,337	9800	35,610
Brookline	55,062	9950	54,787
Burlington	23,486	8250	19,376
Cambridge	95,322	9950	94,845
Canton	18,182	6540	11,891
Chelsea	25,431	9950	25,304
Dedham	25,298	8390	21,225
Everett	37,195	9950	37,009
Framingham	65,113	8110	52,807
*Hingham	6,822	7722	5,268
Holbrook	11,140	0890	991
Lexington	29,479	8600	25,352
Malden	53,386	9950	53,119
Medford	58,076	9950	57,786
Melrose	30,055	9950	29,905
Milton	25,860	9330	24,127
Natick	29,461	7300	21,507
Needham	27,901	8560	23,883
Newton	83,622	9750	81,531
Norwood	29,711	9950	29,562
Quincy	84,743	9950	84,319
Randolph	28,218	7380	20,825
Reading	22,678	8030	18,210
Revere	42,423	9550	40,514
Somerville	77,372	9950	76,985
Stoneham	21,424	9860	21,124
Stoughton	26,710	4510	12,046
Wakefield	24,895	9870	24,571
Walpole	18,859	3020	5,695
Waltham	58,200	9950	57,909
Watertown	34,384	9950	34,212
Wellesley	27,209	8610	23,427
Westwood	13,212	4350	5,747
Weymouth	55,601	6890	38,309
Wilmington	17,471	0120	210
Winchester	20,701	8940	18,507
Winthrop	19,294	9950	19,198
Woburn	36,626	7530	27,579
TOTAL	2,056,504		1,878,025

\*Population North Part of Hingham, 33.54% of Federal Census

## UNITS OF MEASURE USED THROUGHOUT REPORT

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cu.	=	cubic
ft. or '	=	feet
gr.	=	grains
gal. or Gal.	=	gallons
gpd or GPD	=	gallons per day
hp	=	horsepower
in. or "	=	inches
K	=	denotes unites of one-thousand (1000)
kg	=	kilograms
l	=	liters
lbs.	=	pounds
MGD	=	millions gallons per day
MF	=	membrane filter
met.	=	meters
Mil.	=	million
mg	=	milligram
ml	=	milliters
ppm	=	parts per million (approximately equal to milligrams per liter)
rpm	=	revolutions per minute

## METROPOLITAN SEWERAGE DISTRICT

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The Metropolitan Sewerage District which was created by legislation in 1889, had its inception when the Massachusetts Drainage Commission published its final report on December 12, 1885.

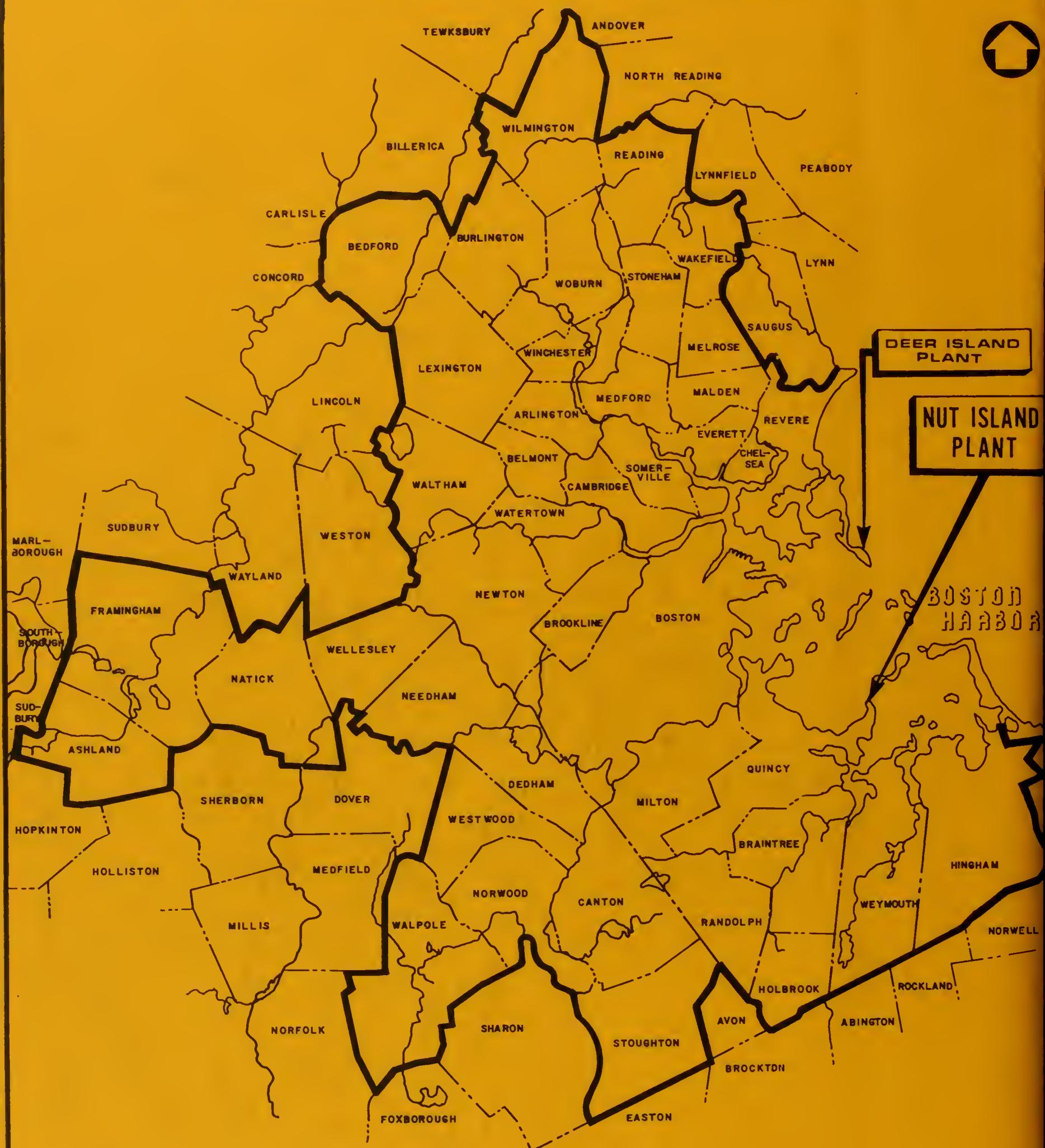
Legislation was enacted after this report to establish a firm, single plan for the disposal of human waste. From this foundation, the Metropolitan Sewerage District (MSD) grew to its present size of 43 cities and towns, who's wastewater is transported, pumped, and treated 24 hours a day, 365 days a year.

At the Metropolitan District Commission's Sewerage Division, we strive to provide wastewater treatment and disposal that is effective and uninterrupted, and to insure the public's health, for whom we all serve.

This Annual Report was prepared and edited by Phil Carbone, arranged and typed by Carol Swirbalus.

Information supplied to this report is credited to the follow:  
K. Donovan, W. Grandin, T. Harrow, J. Kucera, D. Mello, C. F. MacKinnon,  
M. O'Neil, and G. Gallagher.

# METROPOLITAN SEWERAGE DISTRICT



## Legend

— BOUNDARY OF METROPOLITAN  
SEWERAGE DISTRICT  
(NORTH AND SOUTH SYSTEMS)



